

# AVIATION WEEK

A McGRAW-HILL PUBLICATION

MAY 22, 1950



## THE PANTHER... U. S. Navy's Jet Fighter

On Navy carriers and Marine bases, Grumman PANTHERS have proved their serviceability. They were the first jet planes to operate from carriers at night... and at the recent PORTREX maneuvers in the Caribbean a crack Marine PANTHER Squadron achieved a record of 100% availability.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE  
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## We have designs on YOUR ACTUATOR and MOTOR PROBLEMS

The engineering specifications for actuators and special motors for today's and tomorrow's aircraft pose many tough questions...but it's likely that you can find the answer through EEMCO. Our experience in designing and developing many hundreds of special types of electrical actuators and many more photos of your customized die "knock-down" for production and of many other pressurized rigs, compact construction, low weight, and high performance. We have the engineering personnel and facilities to handle the most difficult design and development assignments...and the manufacturing facilities to deliver the largest of orders with gratifying efficiency and speed. This is a source of record with our many customers of ours in the aircraft industry. Due one of your current problems up to EEMCO.

### Typical **EEMCO** solutions of difficult Actuator and Motor design problems



**LINEAR ACTUATOR, Linear Type**

Hydraulic cylinder with built-in rod and lever assembly. Maximum load 20,000 lbs. Stroke 10 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Stroke 10 in. Weight 12 lbs. Stroke 10 in. Weight 12 lbs.



**FLAP ACTUATOR, Linear Type**

Hydraulic cylinder and lever assembly. Stroke 10 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Stroke 10 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Stroke 10 in. Weight 12 lbs.



**EXPLOSION-PROOF HYDRAULIC PUMP DRIVE**

Exploded view of a motor assembly. Contains a 1/2 HP, 1725 RPM, 115 volt, 60 cycle motor. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs.



**DOUBLE MOTOR POWERED DRIVE**

Small motor assembly. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs.



**ROTARY ACTUATOR PACKAGE**

Hydraulic cylinder and lever assembly. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs.



**MOTOR FOR  
VALVE  
ACTUATOR**

Hydraulic cylinder and lever assembly. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs.



**1/2 HORSEPOWER  
EXPLOSION-PROOF MOTOR**

For use in a fixed, hermetically sealed, 10 in. x 10 in. x 12 in. motor assembly. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs. Dimensions 10 in. x 10 in. x 12 in. Weight 12 lbs.

**ELECTRICAL  
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and MFG. Corp.**  
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Performance Charts and Design Drawings for the above cases, and many others, will be sent to engineers and engineers and design personnel. These charts and drawings are the result of EEMCO's design experience in aircraft design problems. They may suggest answers to similar problems of your own. And if these plans, the permanent reference file, sample as requested,

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**Research Dept.**  
**BFG**  
**FIRST IN RUBBER**



## The trim that gives costs a trimming

KEEPING UP the good looks of a plane interior used to be a headache for airline management people. Walls, arm rests, and headrests quickly became stained and mangled—were hard to clean. And repeated cleaning, plus lots of hard use, wore out the trim material too fast.

This picture shows how American Avimac's Avitrim does about it. The walls, wall lining, rail covering, arm rests, and many other places to sheer Boeing Scourers are trimmed with Avitrim. This new B.F. Goodrich flexible

material is practically immune to scuff and scratches. It's so tough that it shows hardly a sign of wear long after many other materials would have gone to pieces. It resists gases, oil, fire, and all ordinary acids and chemicals. Fresh dirt can be washed off with just a damp cloth. And an occasional over-clean with soap and water makes Avitrim sparkle like new.

Avitrim does more than cut the cost of maintenance. It fits snug around over-fit or curved contours. It won't wrinkle with age. The color won't rub off

because it's part of the Avitrim itself. The hot air of planes where interiors are heating over with Avitrim flexible material is a long use. It includes baggage racks, seats, floor coverings, headrests, and many other applications. For info on decorating with Avitrim, write to The B. F. Goodrich Company, Aerospace Division, Akron, Ohio.

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# Aviation Week

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## New Foreign Planes in the News . . .



**LIBELLULA** RCM.2 is a new Italian civilian helicopter powered by a four-cylinder 100-hp engine. Speed is

given at 122 mph. Price is approximately \$7400. Photo from *Aviation Week*.



**WYVERN T.3** (version of Westland's two-seat ground-attack fighter) has a divided canopy and ejection seats. A gun mount is fitted in the nose, housing between two cockpit or gun tubs; it gives a clear view while landing. Powered by an A.3 Python unit of 3676 shp, plus 1130-lb thrust, the nose's wings with an completely interchangeable with the single-type. Flying characteristics of both types are said to be practically identical.



**FOKKER S.13** is a new Dutch biplane fighter all metal construction for indoctrination of pilot, observer, navigator, bombardier, radio operator. Engines are Pratt & Whitney R-1140 SH11-G rated at 600 hp on takeoff and 393 hp each normally. Prop are three-blade sheathed with polished-type blades. The radio is designed for quick conversion to communications and has been held in accordance with the requirements in place for the Air Force and Navy. The S.13 is now being flight tested.



**HERON** (medium transport, flying boat) is shown on first flight by its designer, Geoffrey Page. The 14-17 place has fixed tricycle landing gear. The Heron can carry a payload of 1400 lb at 12,500 ft gross weight for a stage length of 2160 mi. Four engined and unpressurized, DH Gipsy Queen 10 engines are fitted with 1000 shaft hp each. The craft is designed for quick take off and short landing runs. Predictions would within reach ratings. Dive braking, with a consequent cost reduction in both aircraft and spare parts prompt.





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## WHO'S WHERE

### Changes

L. E. Jenkins has been appointed general sales manager for Scott Aviation Corp., Louisville, N.Y. Charles A. Boggs has been named sales manager of Lear Electronics Corp., N.Y. W. N. Morris, sales manager for General Aircraft Co., Ralph Floyd, who succeeds Dickey Foye, now in charge of Air Force methods for the company. James W. Alexander, Jr., has been made sole in the director public relations of Chicago & Southern Air Lines.

John W. Flanery, formerly Eastern Air Lines' N.Y. radio and sales rep., has been transferred to Detroit as regional agency rep.

C. Elmer Goshel has been appointed sales manager of the aircraft division of Hilti Corp., L. I., N.Y. John P. Shatto, who has been with Washington, D.C., sales rep. for Sprague Electric Co., Mass.

### They Knew He Was Coming . . .



... So they baked a cake. In this case it's an anniversary cake. In the case of C. W. Woodward, Delta Air Lines' pioneer in aircraft maintenance, it's the 25th anniversary of his arrival, when Mr. Woodward started to "Along with the cake, Delta's engineers give C. W. the new Captain's keg using a table."

### Appointments

Charles H. Kerssen and R. E. Tietz are heading Semiprotect's division of new offices in Washington, D.C. (2100 Hill Side, 17 and 18 Ste. N.W.), and Cafadores J. M. and J. C. K. are the new managers of the company's new office in Atlanta. Mr. Kerssen has been with the company for over 20 years and worked in field service departments in Florida and Alaska. Mr. Tietz has been with Semiprotect for eight years. He has been with the West Coast for the past two.

William T. Ross, Jr., has been named director of newly formed technical service center formed by Industrial Electronics, Detroit. Ross at one time was in charge of stress analysis for Continental Aviation & Engineering, Detroit.

## INDUSTRY OBSERVER

► KLM is the first airline to install the newly developed jet stack on its Constellation aircraft. One of their 749As equipped with the jet stack was recently placed in regular scheduled trans-Atlantic operation. Still en route test basis, no data on stack performance are available.

► Turbogenerator engineers are excited about a predicted trend toward inter aircraft application of turbogenerators planned to begin taking engine power from the aircraft's powerplants and convert it to electricity at low turbine speeds. For example Allison's T56-A2 (T-33) turbogenerator is rated statically at 2550 shaft hp, plus 4150 thrust. But at takeoff speed of around 190 mph, the 4150 thrust is worth only 100 hp for aerial work. A trend toward more rapid division between propeller shaft power and direct machine thrust is forecast for larger engines. Thus a T56-B3 turbogenerator engine, 1000 shaft hp, plus 3150-lb thrust, gives high value of direct thrust at higher speeds without sacrificing advantage of the propeller for takeoff and low speeds.

► Charles Brabb, U.S. distributor of Canadian de Havilland Beaver light transport, claims 200 sources as getting favorable interpretation of the "They American" act. Procurement of the plane by USAF for Alaska air-sea rescue duty is still blocked by terms of the act despite 10th Search and Rescue Unit recommendation following evaluation tests at Hood Lake, Anchorage, last August.

► Reports that Lockheed Aircraft Corp., Burbank, Calif., might build a new plant and move its facilities around to a point somewhere between Provo and Spanish Fork, Utah, apparently matches the work C. G. Gross, vice-president and general manager of Lockheed, disclosed emphatically that the company has no plans to build a plant in the Utah valley.

► Engineering study for a corvetteplane is being conducted jointly by USAF and Army up to and including wind tunnel tests. Army pressure on USAF is for a single-place corvetteplane with 300 mph speed, having ceiling of 1900 ft. and service ceiling of 15,000 ft. While development is under USAF sponsorship, Army is pressing for flying model out of fiscal 1958 funds.

► Army is looking for development of a single-place helicopter to meet its primary support needs in land combat operations. Army wants a small helicopter powered by either single or dual piston and at top of state Maine. Development would increase mobility of ground forces. Army requirements include provision for easy storage aboard a transportable truck and simplicity of assembly of helicopter in the field.

► Fairchild Engine & Airplane Corp. is studying two new XNQ-USAF T-31 (T-31) trainer planes for the Air Force trainer evaluation competition to be held in July at Randolph AFB, Tex. Other planes in the competition are French YT-34 and TEMCO YT-35. Results should 30,000 fiscal 1950 contracts for YT-34. TEMCO received a YT-35 contract totaling \$52,500. Fairchild contract for 100 T-31 trainers was canceled early last fall. Winner of July competition will probably get limited production contract.

► Wright, Kent, Municipal Airport main runway is being lengthened from 7100 ft. to 10,000 ft. as anticipation of Boeing XB-47 night bomber flight tests. Tests are tentatively planned for Wright after two experimental planes made first flights at Seattle. Longer runway will also be useful for flight testing swept 32-47 and low jet YB-56, being built at Wichita.

► An RCAF de Havilland Vampire jet fighter set a record for the flight between Ottawa and Montreal, Canada, last week, when it covered the 915-km. airspeed distance in 8 min. 36 sec. Average ground speed was 645 mph at 20,000 ft.

► Complaints of noise resulting from testing can-31 aircraft at the Lewis Flight Propulsion Laboratory of NACA in Cleveland Airport, have been received from residents up to four miles away, despite \$250,000 already spent in soundproofing the test chamber. Property owners have retained a lawyer to get an injunction in U.S. court against the name



**Pilot's View**—In the opposite corner were the power plant manufacturers, and a certain private pilot, Captain Collier, editor of *Pilotnews*, *Air Fach magazine* for pilots.

Pointing out that these times as many people are now actively using planes for business and pleasure as before the war, Collier declared that "The private airplane is finding its way. Its greatest future development lies in an opportunity to continue to seek its own level without government regulation and to negotiate and settle its own rules."

Reviewing today's plane, he pointed out that the private and pleasure user has the same function of mobility, and power, down to "reasonable" bargains at \$750 to \$1,000 in the used plane market which are going strong.

"The single, fixed or rotary, is not as useful nor as economical as the used in the every day living of some people," Collier argued as a clincher for his contention that the private plane industry is not destined to be a mass production industry like the automotive industry. And he contended that the weather problem is a far more serious deterrent to a larger personal plane market than any already design push factor.

Official spokesman for the aircraft committee, Joseph T. Crowley, Jr., manager of Aircraft Industries Association's Personnel Aircraft Council, defended the achievements of past years of lightplane manufacturers, and efforts to foster an ideal place to meet them. ▶ These questions he added three pointed questions:

• Is it not true that regulation of low weight aircraft CAA was granted bowed to the, would be necessary by them to that from the same manufacturers and with the same aerodynamic data now available to industry engineers?

• Would not the CAA have to abide by

its own rules and regulations governing design and manufacture, the the aircraft could not be certified by them or anyone else?

• Is CAA to achieve something new in design, were to assess its regulations, then could not the same thing be done for the industry without government subsidy?

Pointing at the bill, Crowley contended, would mean virtually the nationalization of the personal aircraft industry. He favored a seven year cleanup, which would be the likely result of purchases for a (planned) new airplane, which such a bill would catch on.

Another supporter of free enterprise based his argument on money. Robert Ewing Failes, Jr., who had gathered enough of his own and other private capital to develop, without government aid, the Fokker Aerophiles, was probably the most new in the last stage of getting CAA certification. J. W. Goss, Jr., assistant research director of National Advisory Committee for Aeronautics, had pointed out earlier in the week that the chairman of his committee did not choose to serve on the proposed Civil Aviation Council to which the bill would subscribe, lest Crowley indicated that NACA would profit by it with its basic research program, making whatever information it developed available for private application.

► **Opposition** And Backers—Opponents of government aid for personal plane development urged the need for a tax type of small engine to get the personal and business flying market off dead center.

• Personal plane manufacturers were verbally assailed by Merrill Axson, assistant general manager of Aircraft Owners and Pilots Assn., for failure to take advantage of new experimental developments and NACA line data, and for delaying action on earlier gov-

ernment aviation development programs.

• John Geisse, former CAA consultant on the enormous long-haul development, and savings which could have been effected in the present CAA support program through elimination of unnecessary runway. If the proposed new development had begun in the middle 1930s when first proposed as a government development, instead of winter 10 years, as much as \$500 million could have been saved, he said. This is compared to the \$110,000 which was spent on the existing plane development program by CAA to bring it to a standstill.

• Hugh DeWolfe, an engine designer and spokesman for the Council Committee on Air Safety Research, voiced his organization's endorsement for the bill. He saw this type of legislation as the best hope for breaking away from the conservatism in airplane design and getting into development of planes incorporating many modern ideas such as jet thrust and boundary layer control.

• Dean Nels C. Beck of Park College of Aeronautical Technology, St. Louis University, told the committee that the tax measure was "a warning from the public to the safety of the public."

"The reasonably efficient reaction engine of Nazi Germany started at the gas tank with plates and light planes,

and I believe we have reasonably neglected this plane."

He pointed out that the smaller non profit schools were in a position to explore high-powered, high-speed aircraft research programs but had facilities and personnel to do research in low speed personal aircraft if funds were made available.

• Crocker Snow, Massachusetts state transportation director, and spokesman for the department, opposed the bill.

National Association of State Aviation Officials, called for reasons on and development of.

"A reasonably machined with a top speed of at least 200 mph in that it can efficiently break the strongest head winds, with a landing and takeoff speed of 60, so that it will be completely independent of airports or even paved landing strips, no matter how small with the ability to slow down to a walking pace on the air or make it safe for anyone to fly in bad weather and capable of being driven on the high seas in that it can carry its passengers to distant foreign cities in safety, transportation."

"While we have aircraft flying today that will do one or more of these things and do them well, we have none that even come close to combining them all," Snow continued.

And he that had as assistance of dispensing today's fine military and

personal aircraft which "for certain limited purposes are ideal." Bill Snow pointed out that the aircraft had had a place with him in mind and would be used mostly in view of cumbersome regulations and that possibility of profit was too small, to stimulate its development. This was after competing engineers had informed NASAID that the project "is quite possible of accomplishment; using principles understood today if the necessary time and effort is devoted to it."

The solution, Snow interjected, would simply liberalize noncommercial regulations, and provide government funding of acquired basic research.

## Civil Airport Plan Passes Senate Unit

Senate Interstate and Foreign Committee has approved legislation extending the U. S. civil airport development program five years beyond its scheduled cut-off date, June 30, 1953, and overriding Budget Bureau opposition.

Since the seven year program got underway in the 1947 fiscal year, CAA has spent at a rate of approximately \$400 million a year, or about 22 percent of the \$1.6 billion authorized. Only about half of the federal assistance authorized will be used by the 1953 fiscal year, it was estimated.

Requests for project grants now on file with Civil Aviation Administration total \$330 million, the committee said, and numerous local governments are looking back additional as part projects under the program in existence. The amount of federal aid

"for the more efficient and modern airport facilities is increasing from year to year, yet it's clear that there is a long, possibly arduous, time to go to rapid increase in air traffic, changes in aircraft design, new thinking in the plan and handling of aircraft passengers and revised the terminal buildings, etc. It's now apparent that this trend will be going on during the next five to 10 years if one considers the latest technical developments, the SC-10 program and the advances that are being made in jet and turbojet-powered aircraft."

The test chamber itself is 10 ft in diameter, and 17 ft long. A 30 ft door in the side provides access to the test section and is hinged to swing upward for ease and efficiency of engine installation.

A high pressure air supply (not operated) feeds the upstream end of the chamber, and a steady jet sprayer system



RAMJET can be "flown" at Mach 4 and 25,000 ft high in Ordinance Aerophysics Lab test chamber. Large ramjet engine is shown being mounted to 30,000 lb static test cell.

## Convair Operates Ramjet Test Unit

Another addition to the list of guided-missile test facilities was disclosed this week with announcement of a new high-altitude test chamber operated by Convair's Vista Aircraft Corp. at the Convair Aerophysics Lab, El Segundo, Calif. Texas.

Designed for testing of supersonic aircraft engines, the facility is claimed to be able to simulate altitudes of up to 100,000 ft and speeds up to Mach 4 for ramjet engines as large as 45,000 cu. in. diameter.

The new test facility is necessary to meet in year to year it's clear that there is a long, possibly arduous, time to go to rapid increase in air traffic, changes in aircraft design, new thinking in the plan and handling of aircraft passengers and revised the terminal buildings, etc. It's now apparent that this trend will be going on during the next five to 10 years if one considers the latest technical developments, the SC-10 program and the advances that are being made in jet and turbojet-powered aircraft."

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WATCH THE GLOBEMASTERS GO BY

Production of C-130 Globemaster II at Douglas' Long Beach, Calif., plant seems to be moving at high gear. The rods at right are tagged under 11. This new USAF transport

part has over 200 torque units with their field equipment or up to 10,000 lb of payload under normal operating conditions. First C-130 has been delivered to Wright Field.

615,000 cu. ft and \$81,029,000 contract authorization. This includes a \$250-million supplemental to boost aircraft procurement authorized a few weeks ago. The House transacted \$41,362,000 for administrative and operational outlays from the Defense Appropriations account of \$51,156,700,000 and \$51,545,495,000 contract authorizations, recommended by the Budget Bureau (Aviation Week, May 27).

• CAA, \$23,030,000 (51,156,700,000 cu. ft and \$52,411,300 contract authorizations). Despite a \$47,000,000 cut in the Budget Bureau's estimate of \$52,616,380 (\$21,555,000 cu. ft and \$76,161,000 contract authorizations), the top CAA's record \$71,731,861,000 (\$1,157,356,000 cu. ft and \$75,545,000 contract authorizations), including a \$100-million supplemental for aircraft

procurement. Total is a slight increase over last year's over \$1,712,203,100 (\$1,156,700,000 cu. ft and \$75,545,000 contract authorizations) recommended by the Budget Bureau (Aviation Week, May 27).

• NASA, \$23,030,000 (\$1,156,700,000 cu. ft and \$52,411,300 contract authorizations). Despite a \$47,000,000 cut in the Budget Bureau's estimate of \$52,616,380 (\$21,555,000 cu. ft and \$76,161,000 contract authorizations), the top CAA's record \$71,731,861,000 (\$1,157,356,000 cu. ft and \$75,545,000 contract authorizations), including a \$100-million supplemental for aircraft

in the Budget Bureau estimates and \$28,500 below the Board's contingency allocation. The staff statement followed a possibility conflict between CAB Chairman Joseph O'Connell and Rep. John Roncy (D., N. Y.), chairman of the Commerce Department Appropriations Subcommittee (AVIATION Week May 15).

Last week they were studying the possibility of reducing regular airbus trip expenses, perhaps by the passenger, to cover the "loss" flights. They said that the decision that the spanner should carry minimum excess cover age of \$46,000 per passenger and seat, as on the scheduled airbus, was reached previously by the conference, which has a liaison committee with the National Aviation Policy Assn., Washington, D. C., as Joseph Conrad of Waggoner, president; Robert S. Nachting, President, Aviation, first vice-president, and Samuel F. Frazee, Senator Assn. Service, second vice-president.

The Senate Appropriations Committee is now studying up hearings on 1951 fiscal year budgets, but prospects for early action by the Senate, with a heavy agenda of other business, is doubtful. The outlook is that Congress will not complete action on the voluminous omnibus bill by the July 1 fiscal year deadline and that agencies will have to wait at least 30 days, on interim budget authority.

The Senate appeared set to go along with the increased level of aircraft procurement by USAF and Navy. Aviation recommended by Secretary of Defense Louis Johnson after Rep. Cal Vipond (D., Ga.), chairman of the Armed Services Committee, discussed its goals, through the House without the Secretary's signature, an amendment increasing new plane funds. "There isn't any question" that the \$100 million supplemental for new aircraft will be accepted by the Senate, Sen. Richard Russell (D., Ga.) said, adding that the House Appropriations Committee, free, had "Vipond's" word. This would mean that \$1567 million would be available for procurement of 1460 planes by USAF and \$735 million available for the procurement of 912 planes by the Bureau of Aeronautics. This would compare with the procurement of 1159 USAF planes and 798 planes by B-52s this year.

Senate Appropriations Committee is expected to review most—if not all—of the House cut in CAB's appropriation, and make some reduction from the funds for CAB and NASA. The Senate, in the past has increased aviation appropriations over House figures.

**CAA Sparks World Landing Light Plans**

The Civil Aeronautics Administration last week spoke a word in the right place and disclosed a problem expected to loom as a headache of approach lighting projects throughout the world.

The place was the meeting in Newark, N. J., of the International Air Transport Assn.'s Technical Conference. Countries which aircraft were represented at the conference have disclosed work on approach lights and they were certain what the U.S. would do. James F. Angus, CAB ground and

specialist, spelled out in detail U.S. plans, which some time ago had been announced in general by CAB (AVIATION Week June 13).

► **Stop Line without Slope.** The International Civil Aviation Organization previously had agreed on specifications for Type A (low intensity) and Type B (high intensity) approach lights. CAB's own slope line specification meets Type B specifications, and now is installed at the location. But the new line, a control addition, will be cost at only one-half the cost of the original.

In the end of the day, CAB will have installed 17 Type A systems, which will be the slope line strip arranged as a single row on the left of the approach. CAB now is experimenting to see if the lights should be colored red.

DATA is advancing approach lighting at 1400 airports throughout the world. Now that CAB has made up its mind, other governments can move, they have been working because the U.S. has had a large number of experimental data, and the rest of the world is following.

► **Crossed Goals.** About 300 delegations from 20 countries attended the 11-day meeting. Early last week they were asked to submit data for calculation to ICAO on maximum allowable costs and components for various types of plates. The results have a bearing on the effect of economies on runway availability, after which the representatives had decided.

► **Costing Landing gear.** For two years plates with conventional gear, but at double value on tricycle gear, because the manufacturer supplies enough lateral flexibility.

► **Existing airports.** have been designed without extensive meteorological information, particularly on crosswind conditions.

► **Very low key.** During discussions and demonstrations of radio telephone communication, which is being planned by some countries to replace radio telegraph, the conference heard R. P. Durbin, Pan American Airways, say that "telephoning program" has been made in the 35 months the voice system has been in experimental use.

Radio telephony is being carried on independently and independently by five airlines over the North Atlantic. Now, radio telephone equipment in that region is possible with an established network of stations. "It will work here," Durbin said. "It will work just about anywhere."

The CAB position was due to due last week with a two-day symposium on maintenance and operational problems of jet transports, so which about twenty airlines and engine manufacturers were to join with the represented airlines.

## PRODUCTION



GROUND TESTING MACHINES assembled at Lear plant space with new products

## Greer Turns to Airborne Units

Leading manufacturer of equipment for ground tests now developing components for operational use in air

By G. L. Chastain, III

**Cross Hydraulics, Inc.**, which in seven years has become the largest manufacturer of aircraft and ground-support test machines, is turning to the development of specialized airborne equipment.

A laboratory has been set up and special personnel hired to handle the preliminary research. The new line will include cold and dark valves and gauges, flexible metal and stainless

steel tubing, and aircraft valves and gauges. The company's management observed the easy transport of aircraft hydraulic systems by the airlines. It decided that more was available in the way of aircraft test equipment. They found it a logical extension to them to provide with hydraulic test stand for checking pumps and accessories.

The word came Greer's management

that the easy transport of aircraft hydraulic systems by the airlines. It decided that more was available in the way of aircraft test equipment. They found it a logical extension to them to provide with hydraulic test stand for checking pumps and accessories.

► **Keypoint.** In Shape-Happy (page 22), the operators were faced with the serious problem of assembling their three-bladed fleets in a mostly unaided manner. John Kendall, Greer's general sales manager, knew that implicit in sound management is the necessity for having adequate test stands and precise procedures. A visit to all the major airlines revealed that most test equipment in use was far from precise. Greer's development work with precision of form who have helped him when in major portion.

► **Revised Glass.** Although not entirely known, the decision to develop a double component is a revision to the concept around which the company was first organized. A related story can be found in 1951 by Edward M. Garske on hydraulic regulators, and Robert F. Land. First working products were double hydraulic components,

spared, could no longer be tolerated by the airlines. Standardization and consistency of testing criteria had become a prerequisite to effective, efficient maintenance.

Awareness of this vacuum kindled Greer's desire to produce every type of test equipment that the airlines could possibly require.

► **Complete Line.** Working closely with aerospace manufacturers, Greer's engineers prepared quickly with the issuance of a complete line of test equipment. Among these are available:

- Stand which would check out all types of high- and low-pressure hydraulic components.
- Propeller governors.
- High and low tension and high frequency governors systems.
- Aircraft hydraulic oil pump types.
- All makes of fuel and boost pump.
- Units to clean and test a variety of oil filters.

► **Locators** service out.

As each new machine was produced, Greer sought to demonstrate from the manufacturer of the equipment if not to the customer, that the stand was capable of performing factory-approved test procedures.

Kendall then visited the assembly maker, carburetor manufacturer and engine supplier. Test facilities developed a standard set of procedures for the operation of the machine and the planned testing of the particular assembly in question.

As the discipline of standardized testing became more widespread, aircraft manufacturers began to include more and more of the test equipment in their aircraft. This enhanced the utility of test equipment. Greer's new could be purchased more easily and at great savings, since it is not subject to specialized, much unnecessary disassembly of parts and accessories and other means of drive.

► **Integrated Checks.** Independent evaluation service agencies such as Lockheed Aircraft Services, Aerospace Overhaul Division, National Aircraft Maintenance and Goff Supply Co. have all purchased sets of Greer's test equipment to integrate their checks with those of these evaluation centers.

Companies allied to the aviation industry have availed themselves of these test units, purchasing them in test components of these manufacturing on the same basis in the eventual user. Among such companies are Es-Cal-Ci, Pitcairn Governor and the Wichita Mfg. Co.

Thus, for the first time, and compilation began to exist between maintenance, service and maintenance contractors, among the various airlines and within a given airline, a common denominator had been furnished to the language of testing. That there was a





Hall of 500,000 lb. gross weight craft topped by portion of wing center section. Right: Alt. side, showing large pressure bulkhead.



Lowering scaffolding points up structure size. Wing spar web holes set the jet pipe. Right: Closeup shows ribholes, the struts



Ottawa-San Francisco	1600 mi
London-Fernandina	1450 mi
London-Burbank	2000 mi
Riohau Rio de Janeiro	3200 mi
Belmont-Victoria	3500 mi
Victoria-Caracas	3600 mi
Caracas-Darwin	3700 mi
London-Lagos	3200 mi
Lagos-Caracas	3160 mi
London-Chad	3000 mi
Chad-Darwin	3300 mi
London-Perth-Sydney, or Jeddah	3100 mi
London-Bahrain	2200 mi
Bahrain-Rangoon	9000 mi
Rangoon-Darwin	1300 mi
Darwin-Auckland	1200 mi
Singapore-Yokohama	1400 mi

- Then we already have very good aircraft capable of the 3300-mi stage
- An aircraft designed to work stages of 4500 mi would only be little pay load, at least with our present knowledge, unless it would not be economical to go.

I find the foregoing reasons to be sufficient to warrant the building of a 3300-mi range transport.

► **Four-Engine-Having decided to build**

an aircraft for the 3300-mi stage, there are three main choices of powerplant: open to no-piston engines driving propellers, turbine engines driving propellers, and turbine engines.

It is difficult to find a suitable aircraft which exists in form of the particular turbine engines we want, but I would like to try to determine the arguments for and against an open-turbine engine.

Let us assume that the engine rating designed for 3300-mi range weight 170,000 lb. That is a little larger than the Constitution with which everyone is familiar and it therefore easy to visualize.

If we use the best knowledge at our disposal, we can make the structure of such a machine for about 26 percent of the total weight and experience tells us that the equipment, landing gear and crew will weigh about 174 percent. This leaves us with 56.5 percent (that is, 67,750 lb) to cover the engines, their accessories, fuel, oil and pay load.

Let us now try to approximate on paper from each of these choices and see what happens. The engine I have chosen are as follows:

Patrol-type Bristol Centaurus (or in America) Bristol Proteus (or in France).

Takeoff: Dr. Heinkel Gaint (or in Canada).

Taking these engines as only realizing them in our hypothetical aircraft

#### ■ **Bristol Centaurus**

Number of engines required = 4  
Installed weight of one engine 3000 lb  
Cruising flight condition

280 mph at 15,000 ft  
Mean incl. consumption per engine

650 lb/hr (assumed)

Oil required = 4 percent of the fuel weight  
Headload at 15,000 ft 57.5 mph

Distance = 250 mi

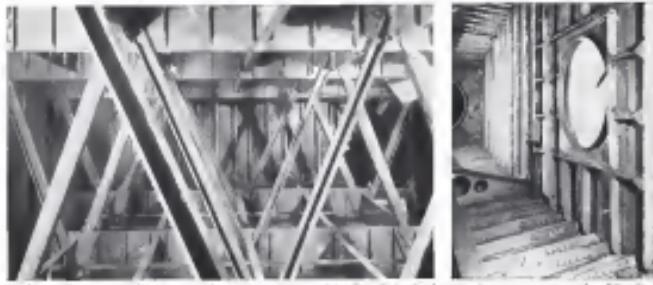
Speed = 35 mi.

Contingency = 5 percent.

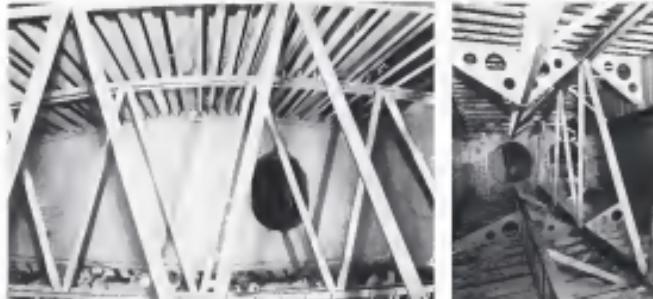
Total hypothetical time in air for which fuel is needed

$$\begin{aligned}
 &= \left( \frac{100}{30.5^2} + \frac{250}{35} + \frac{5}{100} \right) \times 1.03 \\
 &= (15.7 + 6.82 + 0.50) \times 1.03 = 27.5 \text{ hr}
 \end{aligned}$$

## Princess Wing Details . . .



Interior of wing center section. Left: showing spar webs, flanges and housing. Right: Night-engine bay at main wing outboard junction.



Maindeck (left) in bulkhead at built-in. Bay (right) is for port motor coupled engine. Flanges are located on centerline of jet pipes



Left: Inner wing longitudinal fuel bay. Right: Wing view towards bay. Pyramidal rig over center jet pipe holes keeps engine strength.

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RD-4000O,  
RD-4000P,  
RD-4000Q,  
RD-4000R,  
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Total weight of engine, fuel and oil =  $(3000 \times 4) + (17.5 \times 4 \times 0.98 \times 1.04)$   
=  $20,000 + 67,680 = 87,680$  lb.

But we only have 67,750 lb. of air disposal to cover payload, fuel and oil, plus 10% weight. Current engines are around 10% extra but they still carry 15% of payload.

• **Bentley Pratten**  
Number of engines required = 4  
Installed weight of one engine = 4,000 lb.

Crusing flight condition = 575 mph at 15,000 ft.  
Mean fuel consumption per engine = 775 lb/hr. (Assume)

Oil required = 2 percent engine weight  
Residual at 30,000 ft = 95 mph

Descent = 230 ft/min  
Standoff = 55 min

Contingency = any, 3 percent  
Total hypothetical time in air for which fuel is carried

=  $(\frac{3000}{575} + \frac{230}{95} + \frac{15}{55}) \times 1.03$   
=  $(5.148 + 0.37 + 0.58) \times 1.03 =$

15.01 hr. (15.01 min.)

Total weight of engine, fuel and oil =  $(4000 \times 4) + (17.5 \times 4 \times 0.98 \times 1.02)$   
=  $17,600 + 45,200 = 62,800$  lb.

As we have 67,750 lb. at our disposal, we can carry a payload of 5950 lb. (that is, 30 passengers and 2450 kg. and 2000 lb. freight).

• **Dr. Howard Guest**  
Number of engines required = 5  
Installed weight of one engine = 2,000 lb.

Crusing flight condition = 575 mph at 15,000 ft.

Mean fuel consumption per engine = 1230 lb/hr. (Assume)

Oil required = 1 percent engine weight  
Residual at 30,000 ft = 95 mph

Descent = 230 ft/min  
Standoff = 55 min.

Contingency = any, 3 percent  
Total hypothetical time in air for which fuel is carried

=  $(\frac{2000}{575} + \frac{230}{95} + \frac{15}{55}) \times 1.05$   
=  $(3.52 + 0.4 + 0.58) \times 1.05 = 5.51$  hr.

Total weight of engine, fuel and oil =  $(2700 \times 5) + (5.52 \times 3 \times 1230 \times 1.01)$   
=  $13,500 + 35,730 = 68,230$  lb.

As we have only 67,750 lb. at our disposal, this aircraft not only carries extra payload, but fails to arrive.

• **W. E. H. Smith**  
The figures are not strictly accurate, 10% of the weight only and indicate clearly the reason why the turbo-propeller power is not the right choice for the 3500 m range.

• **See**—An established and significant

list about the use of aircraft as fast, provided the ratio of empty/maximum weight does not rise, the larger the aircraft the more efficient it will be.

There are two main reasons for this. First, directly proportional to constant speed, the ratio of the linear distance of the aircraft to the kinematic velocity of an (Brenkman number) becomes higher with increased speed and a 10% increasing reduction in drag occurs. Secondly, because the volume provided for accommodation rises directly as the weight increases the surface area surrounding that volume only rises as the weight is the power of 3 and drag is proportional to surface area.

It is obvious, therefore, that other things being equal, the most efficient engine to build for any route is the largest which the traffic potential will allow.

On the crusing 2300 m stage route the aircraft used has gone from the 23 seat one to the Constellation one at 23 seat and by 40 seats, and now appears to be approaching 60 seats with the Stratocruiser.

For an aircraft planned to go into service between 1953 and 1960, the Benthorn committee's proposal of 300 seats seems to me to be a reasonable anticipation of the need at that time.

Under the heading "Powerplants" I have already had a Preliminary proposal of about 10,000 lb. of thrust, which will carry about 30 passengers and their baggage over the desired range of 3500 m. At first sight, one would expect a 300-seat to weigh  $(128,000 \times 30)/10 = 400,000$  lb. In fact, of course, the very advantages I have already mentioned in regard to the nature of efficiency will also allow this to be done at a weight of not over 300,000 lb.

• **Flying boat or landplane**—Having decided that a 3500 m stage route is warranted, that it should be powered by turbo-propellers and should carry 30 passengers (approx.) and that the aircraft should be able to accommodate the maximum number of passengers, the relative merits of landplane and flying boat.

Let us first of all set down various points which we know to be fact other than opinion.

• **Weight**  
In the small plane, that is, up to about 100,000 lb., the structure of a flying boat weighs a little more than that of the corresponding landplane. In the medium size, between 100,000 and 200,000 lb., there is little to choose between them. In the larger sizes, over 200,000 lb., the flying boat can be made lighter, slightly, than the structure weight of the landplane. The reason being, of course, that whereas the landplane weight remains approx. nearly a function of the aircraft weight, the addition to the fuselage

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friendly credit. Your Socony-Vacuum  
credit card can be used for all Socony-Vacuum  
aviation products.

Signs of Safety and Performance . . .



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**Mobiloil**  
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U.S. AIRPORTS**

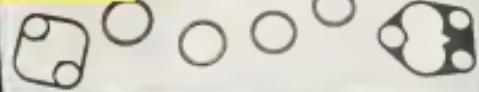
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# O-RINGS

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Special Compound O-Rings



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**Parker**  
TUBE FITTINGS  
VALVES-O-RINGS

which makes it take a hell because  
metals, and consequently lighter is  
proportion to the weight of the air  
craft at the latter instance.

• Drag (and, consequently, speed and  
energy).

For two aircraft having the same  
weight and loading, the flying boat  
will have a drag factor 7-10 percent  
greater than the landplane. This is  
due to the extra drag of the hull bottom  
and, since again, the greater the weight  
at the waterline goes down. An additional  
factor at the expense of the flying boat  
is that at the waterline weight is the  
power consumed, it can generally use a  
length over than the landplane and,  
therefore, requires the drag lost in  
hydrostatic by having reduced wing area.

• Operating Problems

Both types of aircraft require roughly  
similar structural facilities for maintenance  
and maintenance but the landplane requires maintenance a mile  
at once long, while all the flying boat  
needs is a dipper for landing gear. Admittedly, there are many exceptions,  
in which we have heard of many landplanes,  
but it must be emphasized that  
these exceptions were mainly built during  
the last war and are soon going to wind  
up obsolescence. In any case, they will not,  
with very few exceptions, handle an air  
craft heavier than 150,000 lb. weight.

I understand that the construction of  
the most modern seaplane cost about  
£29,000 (\$75,000), but one would  
have to go a long way in flying boat base equipment.

• Geography

Even of the planes listed under  
"Seap. Defense" are either major ports  
adjacent to water and the rest are  
ports of the midwest. None is out  
water.

• Flight

The steady progress throughout the  
century which has attended the development  
of transport has built up a network of roads, railways and shipping lines  
which connect at ports—and deck  
aircraft water.

• Safety

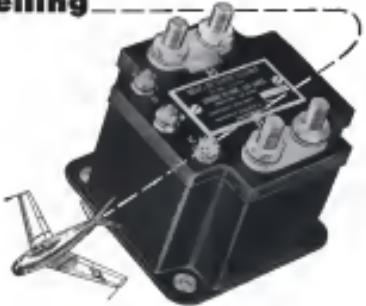
In the unlikely event of a forced  
landing, not only is a flying boat able  
to have a landing on water but she is  
able to do so in the shortest possible time.

This is due to the fact that there is  
more positive contact between the  
passenger and the ground.

These facts provide sufficient evidence,  
in my opinion, for a verdict in  
favour of the flying boat if we are going  
to have aircraft of 300,000 lb. and over.  
Before leaving the question of landing  
sites versus flying boat, I should like  
to add a few words about airports.

It has been stated frequently of late  
that every country in the world has  
given up flying boats because they are  
unreliable, and now BOAC have

## Ceiling



...81,000 cycles

**Amplifiers:** Make contact at  
2400 amperes, 25 volte break at 400  
amperes. **Carry out** for 30,000 cycles.

**Interrupt current** to 3200 amperes  
at 600 amperes on break. **Carry out**  
for 31,000 cycles.

This newest out record of the  
Hartman A-711C Jet Starter Relay  
emphasizes its high factor of safety  
... shows why there is no service  
calling so long, trouble-free performance  
under all normal operating  
conditions.

Standard setting of the A-711C  
relay is to close on arcing currents  
in excess of 400 amperes, drop out  
at 235±35 amperes. Other settings  
are available. The contact closer

\*Manufactured to Specification AN3131. Literature on request.

**the Hartman Electrical Mfg. co.**  
MANSFIELD, OHIO



# ENGINEERS NOTEBOOK



## QUICK COUPLING FOR TURBINE DUCT

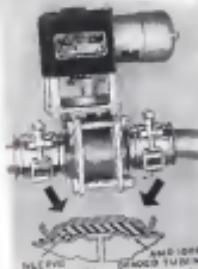
MINIMUM FRANCO COUPLING  
WITH QUICK COUPLER  
CATCH AND RELEASE LEVER  
INTEGRAL POSITIVE SEAL  
WITH FAST ASSEMBLY  
AND DISASSEMBLY

DESIGNED FOR USE ON  
FOLDED OR MACHINED  
FLANGES



## POSITIVE SEAL FOR AIR VALVE DUCT

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FOR AIRPORTS AND AIRPORT  
BAGGAGE TURBINES AND PUMPS.  
COUPLING ALLOWS A  
SMALL AMOUNT OF MO-  
TION ALONGMENT AND MANU-  
FACTURING TOLERANCE  
BETWEEN SEPARATE  
ASSEMBLIES FOR SHARP  
REQUIREMENTS ... TO  
ACCOMMODATE TEMPER-  
ATURES FROM -40°F TO  
500°F PRESSURES TO  
400 PSIG AND TORQUE  
DUE AND FRICTION  
RESISTANCE



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tricks off them for the same reason. What are the facts? First of all, which countries ever used flying boats?

• Germany, Italy and Japan, who lost all their designs in the war, and haven't any new ones yet in the pipeline yet.

• France, who is still building new ones.

• America, whose enormous internal or low demands for fuel planes neutered out the commercial flying boat (a fact which they are beginning to wonder about).

• New Zealand, who still uses them, having just replaced Sandringham with Solent.

• Great Britain, who is just stopping the use of most of them.

In other words, only people who are stupid to have taken them all for granted of economy use BOAC, and as far as they lay them off. Barry Adams of Anglo Airways buys them up and rents them at a profit. In addition, I understand that there is a strong possibility of British Empire Airways operating T. E. A. U.'s old Sandringham.

It has been said that the faults to South Africa were too slow and that the overnight stops were too expensive. The jets, of course, had although the scheduled trip was one of 5 days, this was because of an agreement with South African Airways who do the fast trip with Sandringham. The Solent could do it in 11 hrs.

Another thing which annoys me is, of course, the way people compare those good old Shear boats with relatively unsophisticated designs at least 10 years later.

► How can the Panamax design—have now shown as briefly in *EW*—that the Princess is based upon logical, step-by-step thinking. She is, in fact, the only aircraft in the world, with the exception of the Bataan (which is, of course, a landplane) capable of operating a 3500-m. stage under all conditions.

The progress to date made at Cossor has astonished many and completely confounded some, particularly when measured against the background of the comparatively meager use of the firm.

These have been setbacks and hold-ups both at Cossor and at Bristol, where the engines are being made, but these have been ironed out methodically and successfully. Our program has had to be modified. When the program started with a landing gear problem has not had to be abandoned. Does the record of those who estimate the project bear close examination or this request?

► What about cost? One well known study paper recently stated that the original estimate for the three Princesses was £2.8 million (\$5,945,000), that this passed to £3.7 million (\$12,600,000) with engines and had now reached £9 million (\$25,200,000).

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**SILICONE RUBBER**, with its unusual characteristics, opens up vast new design possibilities. Arrowhead, in pioneering the fabrication of silicone over the past three years, has accumulated a store of experience and know-how which is available to you.

### SHREWS and RUBBS

Versatile **ARROWHEAD** flexible bearings during war employing the available of unpatented or patented silicones reduce vibration. With permission from *Dark Age*.



### MASSIVE RUBBER

**Silicone rubber** 12" long, 4" wide, 1" thick, weighing 100 pounds and several similar monoliths of all kinds are a part of daily production at Arrowhead's Silicone Department.



### BE GUT RUBBON

Silicone rubber and silicone coated fibers are vital materials for aircraft gaskets and other high temperature parts. **ARROWHEAD** gaskets are serviceable at temperatures up to 500°.



### EXTENDED RUBBONS

Arrowhead silicone sealing and insulation are finding new uses where exceptional properties under unusual conditions are required.

For further information call an Arrowhead field engineer, or write the factory.

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Well, well! Fortunately most of us have long memories. I have a cutting in my office from the *Times-Picayune* dated three years ago in which the cost of the three *Principals* is quoted as being \$10 million (\$38,600,000).

Now quite finally, I don't know what the *Principals* are going to cost; but that's all the business is not my concern.

Now let us suppose, for argument's sake, that the correct figure is \$12.25 million (\$55,500,000) each. What does that mean?

First of all it means that if the *Principals* are operated over their designed wings of 2900-3000 m.s. for the normal utilization of 3000 flying hours per annum, with all anti-fouling, then direct operating cost works out at \$10 (2.0%) per passenger per mile.

The \$10 (2.0%) includes the fuel, landing. Depreciation of capital values down to 20 percent in eight years, insurance, maintenance and operational, engine, cabin, fuel and oil, landing charges.

If we assume overheads and profits to be 100 percent then the total operating cost becomes \$14 (3.1%) per passenger per mile, or \$39 (91%) for a single flight from London to New York City.

Not bad considering the following present-day fares:

• Queen Elizabeth, 1st class	\$130 (\$36)
• BOAC	\$120 (\$33)
• Queen Elizabeth, cabin	\$28 (\$7.2)
• Queen Elizabeth, tourist	\$80 (\$20.6)

If on the other hand, my figure of \$3.75 million (\$11,500,000) for the first cost of the three *Principals* is wrong and if it really were 10 million (\$3,600,000), the balance of \$3.25 million (\$10,800,000), spread over the eight years taken for depreciation, puts another \$10 (1.5%) per passenger per mile on the fare and makes it from \$39 (91%) to \$55 (13.8%).

It makes the *Principals* be a heavy drain on the poor taxpayer as far as resources, provided that incentive expenditure is not thrown away on big heavy administration.

► Set-up-The financing agreement will, I hope, soon to convince any reader, if I am myself convinced, that the *Principals* is the right answer to a great need.

There is only one thing wrong with the project and that is the fact that only a total of 15 (or even 23) are being built.

A larger order would not only push the first cost of each aircraft and improve the operating economics of the fleet but would enable Great Britain to stand out in front of world aviation

instead of merely presenting an impotent experiment.

I may well be accused of being prejudiced in favor of flying boats. This is perfectly true, I am. When one hangs on getting the same answer to one's own question, one does tend to become prejudiced.

There is also the possibility that one is right.

## Arresting Hook

### Problems Studied

Safety of aircraft carrier flight operations may be substantially improved by an arresting hook research program along the lines of *Chase-Vought Aircraft*, Dallas. Need for the program becomes apparent to those engineers when a survey showed about half of carrier cycles incapable of arresting hooks operations.

Jet aircraft, with higher touch down speeds and faster approaches, make the problem of arresting gear engagement more difficult, and design engineers need the answers to these questions:

- How high does the hook bounce?
- After bounce, how long does it take to arrest the aircraft?
- What are the loads, loads encountered in deck impact?
- Test Procedure—To get these answers, *Chase-Vought* engineers have developed a catalog which replaces the usual procedure by throwing the deck at the hook.

A 480-lb. cart simulating the carrier deck, was propelled along a 60-ft. track by compressed air. The cart reaches speeds in excess of 100 mph. at the start, where the test hook is located. Measurements of the position of the deck on the deck, the total of hook, impact, length of stop by the deck, and any subsequent contact with the deck following impact.

A motion picture camera photographs hook bounce, using a grid background to show length of the hook's chord.

Strains on the hook are recorded by an extensograph, and a photostat at staggered gate speeds for reference.

The moving cart is stopped in 45 ft. by a piano-type wire break.

► Design. Also—Goal of the research program is the development of a dashpot (hydraulic damper) which will prevent the correct amount of hook reaction after deck impact over a large range of horizontal and vertical speeds.

*Chase-Vought* engineers hope to interest other aircraft manufacturers in evolving a standardized design of aircraft arresting gear so that hook cart will no longer be a hazard to carrier landings.

**Electrol**  
Devises  
ALL TYPES OF  
Aircraft  
Hydraulic  
Devices

Here you see but a few of the many hydraulic devices which Electrol produces for America's leading aircraft builders. Many of which of them you select—not scared, it is both designed and built to meet the exact requirements of economy, size, weight, ease of installation and maintenance. Further, through Electrol's more advanced production techniques the economies of manufacture which are passed along to you. An extra line gratified your requirements may be illustrated. In requesting a catalog to give you a true and money saving service in your development work.

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#### DESIGN FEATURES

1. Simple Relays on-circuited.
2. Automatic control reliability after linear hours of uncorrected generator life in overvoltage and overload conditions.
3. Ground fault protection with current limiters or shunts.
4. Enclosed relay box.
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8. Horizontal and vertical trip-free operation.
9. Field relay automatically trips with reverse generator polarity.
10. Lighted switch for compressor trip.
11. Generator overtemperature indication. Dualwell (heat rise switch operation).

For complete specification data, contact the nearest Westinghouse Sales Office.



1C



1B Dual Generator with Ground-Connected Fault and Fault-Isolating Protection

## AIRCRAFT D-C ELECTRICAL SYSTEMS

**"packaged" for four-way savings**

Westinghouse placed in service the first "packaged" and protected dc electrical power systems for aircraft early in 1946. In many new and current features have new been thoroughly service-proven in hundreds of commercial and military installations. Continuously developed improvements

means provide the system of the future.

The D-C system diagrammed here is typical of those operating on aircraft such as the Martin 202, the Lockheed P2V, the North American AJ1, the Northrop C-125, the Aero Sud-Est SE-2040 and the Boeing 747. JAMES

#### The economic advantages of these "Packaged" Power Systems are fourfold . . .

##### 1. Quick and Easy Maintenance

Convenient plug-in-type control panel permits off-maintenance of controls to be performed at shop bench. Engine runup operation is no longer necessary for accurate positioning of generators. Generators equipped with the Westinghouse brushless design may be removed and replaced in half the time required with the conventional commutator design.

line. The generator overheat time can be coordinated with the engine overheat time.

##### 2. System-Wide Power Protection

Instantaneous fault isolation results in far less risk of damage to generators, control devices, cables and structures during the existence of the fault.

##### 3. Long-Life Parts

"Packaged" components have been carefully engineered and contacts are of liberal size to give extra service life. Records show that the new voltage regulator has greatly extended life over other types and replacement parts cost

not an assembly of individual parts but an integrated "package" designed and produced by one manufacturer with individual responsibility for the service and performance of every component.



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Leader in Aviation Equipment





## The Tougher the Better!

The tougher the insulation—the longer the life of Thermocouple Lead Wire.

Our newest insulation, monofilament, has high temperature ability with broad electrical resistance. Lead wires with Thermocouple Lead Wire are built with:

- Very Improved Electrical Conductance
- Alkaline resistance
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As illustrated by  
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Smidt & Smidt  
Available in All Standard Thermocouple Materials

Alloy metals Thermocouple for your  
Acrylic Monofilament and Polyester  
needs. Write for Catalog C.

Thermo ELECTRIC CO.  
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### TUNE THE RECEIVER . . .

and listen to the source satellite. Listen this morning. That's all there is to it. Listen to the source satellite. That's why some firms make one and others make many other models.

Only NASA considers quality, some of operators and accompanying launch vehicles.

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Considering only the 360-day continuous immersion test, a certain class of phenolic laminate exhibited the least change in dimension, and a paper phenolic laminate showed the greatest change in flexural strength at the three levels.

► **Volume on Weight**—In all these tests the weight change of the majority of the laminates was less than 1.0 percent in the cyclic test, and did not exceed 1.5 percent after 360 days of continuous immersion. The largest weight changes were usually experienced with immersing to toluene.

With very few exceptions, the length and width changes after either the cyclic or the 360-day immersion in the fuels did not exceed 1.0 percent. In both types of test the changes in thickness were found to be no more than one percent.

The least weight and dimensional stability in all three fuels in the cyclic test was observed with the glass-fiber reinforced-polyester laminate.

After the 360-day immersion test, in the majority of cases the weight and dimensional changes for the samples that were tested immediately were equal to or higher than those that were conditioned before testing.

► **Flexure Strength**—Changes in flexural strength for the cyclic test and after the 360-day immersion test were, in most cases, negligible. However, the changes were not over 30 percent for all of the samples.

The changes in flexural modulus of elasticity were, in the majority of cases, negative in the cyclic and the constant environmental tests. In the cyclic test, losses greater than 10 percent were shown only by the cotton fiber reinforced-polyester sample.

After 360 days of immersion, an losses greater than 10 percent occurred.

► **General Discussion**—Since there are no appreciable differences in the properties of the various types taken from the same batch in different batches made by the same manufacturer, and even in similar laminates made by different manufacturers, only general discussions about the different types of laminates can be drawn from this evaluation.

No single sample exhibited maximum changes in all of the properties, under the different conditions of immersion and with the three different fuels used in the test.

### Sandwich Trouble

As we are finding that sandwich-type forming material has not general acceptance in many industries.

The upper surfaces normally are too weak to withstand highly concentrated loads (such as those imposed by hot cement or high-lead tiles). Once

deformation occurs between outer surfaces and core material, it spreads rapidly and soon large areas are affected.

A factor which may be contributing to deformation is the infiltration of water at solvents used in cleaning up at the joints.

A new type of forming have given us excellent results. Free of the phenolic (epoxy) resin and laminating material, they hold as well as Castolite, while Ecolite Air Lams has compensated little trouble with a cotton board honeycomb fibrous material, the upper surface of which is covered a 4 mil sheet of Castolite. This type of forming will be installed in EAL's newly purchased Martin 484-4.

### Ignition Systems Meeting Held

London—The meeting was attended by the majority of all major engine serving firms when representatives of 15 oil companies operating with Europe met here recently for the first European conference on aircraft ignition systems. Sponsored by British Engines, Ltd., of Rugby, England, the meeting brought together the major engine and equipment manufacturers, the major suppliers and representatives from manufacturers of sparkplugs, ignition equipment and avionics fuel.

► **Discussion**—Summary briefs were stressed in the papers and discussions that followed aimed to point toward a list of requirements to be met by ignition system manufacturers. For example:

• **No-maintenance** spark plugs, good for one complete engine life, were suggested by W. Evans, VCA.

• Local feeding of plug is apparently unavoidable, as the past year or two has led to many improvements. No satisfactory material for this purpose has been found, according to F. R. Banks, Associated Eddy Corp.

• **Low-tension** ignition systems were generally agreed to be superior to the high-tension types from the viewpoint of sparkplugs life and radio interference.

• **Master coordination** in ignition harnesses benefits some operators, according to detailed insulation of the harness.

The British Thomson Houston company decided not to reinforce its Spravay version, because of its difficulty in diagnosis of breakdown trouble, decision indicated.

At an Air Transport Association meeting and Management Conference at Kansas City (UPI story, April 17), speakers urged the development of a plug tester that would simulate more closely actual operating conditions.

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### Defense Against Clogging and Wear



There can be no more demanding job for filters than in today's high speed, long range planes. That's why manufacturers and the U. S. A. F. turn to **Bendix-Skinner** filters. They know from past experience, as well as current operational records, that nine times out of ten **Bendix-Skinner** filters will supply the "finest" answer. Why not let **Bendix-Skinner** filters solve your problems too?

Over 300 Models providing filtration from 10 microns (1000 microns) to their rated life of 2 to 2000 p.p.m.



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## Carriers' Profit Outlook Varies

Standard and Poor's survey sees air coach effect and possible mail cuts as keys to 1950 results.

In a current survey of the air transport industry, Standard & Poor's classifies the group's profits this year will be mixed.

The advisory service believes that passenger traffic will end flight tonnage flows by the winter, although airfares are expected to advance in 1950. But passenger carriers are expected to benefit through the effect of air mail and other income traffic. Operating margins, however, should show a slight (up to 4 percent) as an improved plane utilization and more experienced personnel.

Total earnings may decline from the good 1949 results, since tax credits and net operating profits will be smaller, according to Standard & Poor's. In the final analysis, the outcome of air coach expansion and possible mail cuts will play an important part.

Its strong possibility that the major carriers will respond to these trends and that dividend payments will be assessed by additional factors due to recent increases in financing, are encouraging prospects to the advisory service.

Standard & Poor's estimates the somewhat improved results for first quarter 1950 to the cold winter weather and increasing acceptance of air travel. **Passenger**—The mail last-quarter deficit was larger than a year ago, although mail companies reported profitable operations. **United**, **Braniff**, **Capital**, **Continental**, **TWA**, **United** and **Western** all made profits. **Delta**, **Eastern** and **National** enjoyed a gain in profits with the late pickup in northeast vacation traffic.

Lower deficits sustained by **Aeromexico**, **C & S** and **Northwest** reflected mainly in 31 day strike in Mexico, a strike in the oil business of Venezuela, and high initial operating costs of the **Stratocruiser**.

**Air Panel Post**—The advisory service reports that no panel post is beginning to take hold and domestic mail tonnage may register a small gain this year, following a rise of about 4 percent in 1949. The mail savings, however, for the four largest carriers, however, contributed to the 6 percent decline in total domestic mail revenue in 1949. It will probably have about the same effect this year.

Air freight revenues also are expected to show a continued growth trend, but

air payments denied of any subsidy, but other carriers did within the subsidy category to varying degrees. Aerotrans is directed to the vulnerability of carriers which are highly dependent upon subsidy payments to demonstrate revenue to mail pay in the event of increased postal rates.

In general, individual companies, Standard & Poor's believes that favorable economic prospects for American carriers and United in 1950 because of relatively better positions in respect to mail pay, broader use of new planes, and the plane outlook. In these instances, prospects of dividend re-umption that have been naturally enhanced.

Combined results of TWA, added by July 1949 traffic to Rose, are likely to be sharply better, but capital needs preclude dividends. On the other hand, Northwest may make a poor showing if it continues to maintain its 100% cash dividend. **United** is in a better position, while the high subsidy rate rate for international and aviation flights appears in jeopardy.

► **Segment Commodity**—Septic tank market for the major carriers is as consolidated by Standard & Poor's as the postal subsidy review. In addition to the company mail sheet, the advisory service has this to my

► **Braniff**—Unless a lesson can be learned from new planes and absorption of major operating expenses in past years, the airline will probably not be able to compete.

► **Air Coach**—Against these factors, the advisory service believes that passenger revenues will suffer slightly. That year flight broader as coach service, being rendered at prices ranging from 20 per cent to 35 percent below the standard fare of 60 cents a mile. Studies of United Air Lines are quoted as indicating that a sizable portion of regular-fare traffic has already been diverted to the cheaper flights.

► **Carriers & Southern**—Long term prospects of Caribbean services from existing at **Cubana**, **Venezuela** appear promising. The domestic market, however, is not so bright. **Carriers** and **Delta** to New Orleans and Houston, however, is comparatively less in passenger operations, competition from airline carriers is here, and a relatively high rate of mail compensation is needed for profitable operations.

► **Western**—Seasonal variations in traffic are evident over the company's route pattern, competition from **United**, **TWA**, **two** **Hawaiians**, and **emigrant** or **caravan** is here, resulting in relatively heavy dependence upon mail and cargo revenues.

► **Post Panel Post**—The optimistic forecast is given to the increasing likelihood of mail rate reductions, because of pressure for economies of government. Standard & Poor's expects legislation designed to separate service and subsidy payments to or endowments the advisory service indicated above.

—Selig Atchison



If you wonder why we're always hanging on safety, ride a gondola or using canoes down from a recent CAA and you'll find us accident-free.



In open planes, 5 out of 1000 crashes are due to pilot error. Nearly half of these mistakes result from recklessness.

The study, concerned with the "Human Element" in flying, analyzes involving planes other than commercial air carriers, blamed pilot for 75% of the fatal crashes in which 1300 persons were killed.

They found that 1 out of 4 crashes involved least one of three types of errors: sudden lurch, loss of steering flying speed, and flying out weather which bluffed out the ground.

Does this answer your question?

#### And Speaking of Being Careful...

A power of otherwise平凡的pilots ignore there is no real difference in violent motor oils.



Well, they're the same sub-fined fly boys you see hangin' round the hangar, always waiting for their ships to be re-fueled, sleep-walking along steady paths and bags.

But they got troubles, but we got the answer and it's simple to *do* it.

► **Goodyear Gullwing Aviation Oil—Braniff**—and you're halfway along to winning the plane-hopping flying.

Unipetrol Aviation Oil Series D-1000 is the world's first derivative (synthetic) for aircraft originally designed for the only light plane to get through Gulf's exclusive Activair process to assure extra cushion and sludge-free.



Try it and increase those periods between overhauls up to 1200.

#### Little Known Facts Dept.

Good buck, please, he needs it! We can't afford to let Gulf down, Willya, and for the public's sake, we're asking Little Known Fact About Gulf Known Please, submitted with overwhelming proof!

► **The Bug**—a giddy place where was the home of the famous V-4, was developed by the U.S. in 1947—see

never used, although it has successfully run on four test flights.

► **CHICU**—Well, anyway, **Aeromexico**, **Ran**, **cup boy** Your **Caribbean** of **Fruit** Pilot (bottom right, anyway) is on the way.



Take him, **Chopper**, or you'll be taking him home. Let's hope, why not share for your own convenience?

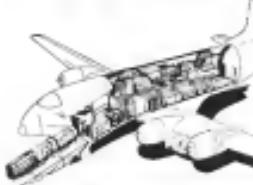
Don't return carrying **leather** **leather** your **Little Known Fact About Gulf Known Please**—in that edition.

► **Wet Aviation Sheet**, **Gulf Business** **Primerium** **et. Pa.**

#### Gulf Oil Corporation . . . Gulf Refining Company . . . Manufacturers of



# GIANT ALL-PURPOSE AIRLIFT!



**C-124** — smooth transport designed by Douglas is the most versatile and flexible cargo and troop carrier in the air today.

Sixty-five of these sky giants are in production for the Air Force, with deliveries scheduled soon to Supply Squadrons of the Strategic Air Command.

Each plane is able to carry anything up to 50,000 pounds—diverse general cargo, 200 troops, or 94% of all military vehicles, fully assembled. This means that only a C-124 fleet can transport by air an entire standard industry division, including all the millions of pounds of aircraft required for its continued equipment and support. The C-124 is also self-sufficient for rapid loading and unloading.

Furthermore, propeller-turbine engines can be readily installed in the current C-124 design, making possible more payload, longer range and greater speed.

LONG BEACH PLANT OF DOUGLAS AIRCRAFT COMPANY, INC.



## DEPEND ON DOUGLAS

30<sup>th</sup> ANNIVERSARY YEAR



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LONG BEACH PLANT OF DOUGLAS AIRCRAFT COMPANY, INC.

## NEW AVIATION PRODUCTS



DECELOSTAT, complete with housing. VIEW OF unit ready to mount on wheel.



### Decelostat Designed to End Skids

Westinghouse's new unit balances braking effort against rolling friction to prevent skidding.

An aircraft Decelostat, designed to make it responsible for a pilot to skid the main landing gear wheels, has recently been developed by the Aircraft division of the Westinghouse Air Brake Co., Whiting, Ind.

Design and operation of this device are similar to the antiskid attachment put out by the Boeing Airplane Co. and known as the Skid-Ave, Inc. (American Wkngs Aug. 15, 1945). Basic difference from the Boeing unit is in the supply valve assembly. The Westinghouse valve is mounted internally, the Boeing valve externally.

One Decelostat unit, weighing 3.07 lb. and measuring approximately 6 in. in diameter by 1.8 in. in depth, is mounted on the outward side of each landing wheel so that the centerline of the wheel and Decelostat coincide. When the aircraft lands, the Decelostat turns with the wheel to which it is attached.

► **SKID RELIEF**—If the wheel commences to skid, the depression of the unit results in an integral master valve which, by direct pressure, leads to a spool and shaft, operates a valve to relieve brake pressure and thus halt further skidding.

At little pressure is released and deceleration rate returns to the point where rolling friction is again greater than braking effort, braking pressure is automatically re-established to continue the slow-down of the plane's momentum. By mounting the Decelostat valve at the brake, transmission time of a

skid swing is claimed to be possibly because of greater ability to increase deceleration rate by locking wheel machine friction.

Patent further states that it is conceivable, because of locking and loss of friction, to stop an entire aircraft in one-tenth the time of a normal skid.

Use of this product is reported to have limited production of main landing gear at such as 150 percent. It is described as equally effective in a fine sand or desert engine.



### British Instrument

A landing gear position indicator which is stated to take up 10 percent less instrument panel space, is claimed to operate with greater reliability and precision than earlier models. The device, which follows this previous British model, is offered by Dowsy Equipment, Ltd., Chelmsford, England.

Unit has standard SAE case, is standardized by the Ministry of Supply in all future military and naval aircraft and has been approved by the Air Registration Board.

Instrument carries 9 spring-loaded latches. Arms to these are guided by bearing sleeve at center of dial after which entire body of dial can be drawn from dial case. Reversible latches are removed from body and indicator is strengthened to later Ministry of Supply requirements. Including cable only gross weight is 1.66 lb. and it is 4.68 in. long and 2.37 in. square. It weighs 0.5 lb. compared to 1.16 weight of previous standard model.

Perhaps the surest way for an item to reduce the high, hidden cost of carrying aircraft inventories of round stock is to have it made on the reservation, close at hand, government of established, reputable supply organizations.

Many aircraft purchasing agents realize the advantages of such procedures. In fact, the aircraft division of the aerospace division of Van Dusen has warehouses at Indianapolis, Terre Haute, N. J., and Dayton, Ohio, in many of the major sections.



J. W. Miller, President of Mid-Continent Airlines, shown with C. A. Van Dusen, President of Van Dusen Aircraft Supplies. Commercial aircraft carrying 25 tons in the mid-west, visits Van Dusen for many supply items.

There are three distinct advantages in buying from Van Dusen supplies:

- Annual cost of items used or cause items less when bought from an aircraft supply house because of reduced handling and inventory costs.
- Fast working capital is kept up to large needs in aircraft model houses.
- Ready obsolescence of parts is considerably reduced.

There are two types of the reverse poly (esters) major aircraft purchased from Van Dusen Aircraft Supplies:

**Van Dusen**  
AIRCRAFT SUPPLIES INC

Serving all 4 BEST  
Markets of  
MANUFACTURERS  
DESIGNERS  
PROPS  
PARTS  
MATERIALS  
MANUFACTURERS

## Torque Wrenches

Line of 12 high-speed Prost torque wrenches has been announced by Phoenix Tool Co., Los Angeles, Calif. Wrenches are guaranteed by test, and are light and compact. They have a dial torque reading. When wrench is applied to the reading, the lever trips a signal trigger. A strong impulse is applied to the hand and a hand clutch is freed, causing operator to release wrench at desired torque setting. Wrench also runs the dial and pointer on the wrench.

Major points out that these design permits operator to work in blind spots, and light and under other adverse conditions with speed and accuracy. Wrenches have sturdy, one-piece, balanced mounting elements and to be extremely efficient and accurate in use. Wrenches have capacities of 15, 30, 50, 100, 250, 300 and 500 ft. lb. Other models have capacity limits of 350, 600, 1200, 1800, 2400 and 3600 in. lb.

## Lightplane Sparkplug

New unshielded, ceramic insulated, resistor spark plug, specially designed for use with Continental A90, A95, C75 and C80 engines, has been developed by The MG Corporation, 116 W. 52 St., New York, N. Y. Known as Model 700E, plug is approved by CAA as MG-1000. CAA Code.

Unit includes resistor which reduces gap corrosion and prevents plug to operate for long periods. Insulating material is aluminum oxide, used as platinum electrode plug produced by firm. Plug also is available without resistor. This is designated simply Model 700 and is fully approved for the same engines, according to MG.



## Milling Cutter

A new type of inverted tooth cutter for slotting and side milling is offered by Lovett Tool Co., Inc., Springfield, Va. Designated Type S, this cutter features blades which are standard carbide blades held in place by a special type of wedge. Moyer says use of this type cutter reduces maintenance time because of ease of setting, grinding and replacing the blades. Note there is no bearing and steel does not have to be

ground, inverted shanks only are required for sharpening.

Many blades can be mounted on the body of the cutter, four diameter cutters and larger hole sizes can be used without increasing the body. Design also permits extremely narrow cutters to carry inverted blades with complete rigidity. Company states it is easy to maintain high strength widths and diameters and one cutter body can hold any grade of carbide blade for cutting any type of metal. Cutters are available in widths from 4 to 15 in. and in diameter from 1 to 3 in.



## Spotwelder Control

An pressure operation of conventional, foot-controlled welder arm spot welder is offered through use of Weld-Air Auto-Mate control, produced by R. W. Hoffman Co., Inc., 12 S. Clinton St., Chicago, Ill.

Unit clamps to upper horn of spot welder and operates on reduced air pressure of 15-20 psi, eliminating necessity of all vacuum arms unnecessary. Pressure is controlled by electric foot switch which can be conveniently clamped to the floor. Switch energizes a pressure operating valve. Equipment is designed for use in conjunction with any standard weld timer control and requires at least 4 cu. ft./min. air supply with a maximum of 50 psi line pressure.

## Molding Compound

Silicone molding compound specially suitable for circuit breaker switches and other parts where resistance to an acid and cohesive heat is required, has been developed by General Electric Co., Princeton, N. J.

GE says its newest is the first commercially available silicone molding compound. It consists of a silicone resin and glass fiber filler.

Designed to withstand continuous heat at 375° F., compound also has high arc resistance. Material flows well in mold, does not support combustion.

## In the final accounting

# TORRINGTON NEEDLE BEARINGS show many cost advantages

Your product may benefit from economies in design, manufacture and assembly, through the use of efficient Torrington Needle Bearings.

Unit cost is low. Designs employing compact Needle Bearings are simplified... housings and shafts require less machining... fewer parts are needed. Fast installation, by a single arbor press operation, can save you money, too.

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## TORRINGTON NEEDLE BEARINGS

NEEDLE  
SPHERICAL ROLLER  
TAPESTRY ROLLER  
STRAIGHT ROLLER  
BALL  
NEEDLE ROLLERS





actor in defense planning yet, the Comce and DC-4 equal in transoceanic production, with little world Comce holding a slight advantage.

Kates remained but added that the immediate usefulness of the Comce and its fleet in the military as M-Ds is limited. A recent survey showed only 25 percent of the transoceanic long-range planes capable of carrying cargo efficiently, and only 10 percent were able to carry passengers profitably.

**Modifications Planning**—MATS has already defined the standard changes required to fit 14 civil four-engine aircraft to military needs, and has suggested methods of accomplishing the modifications. Detailed planning of how the conversion can best be carried out is now under active development within the Air Compting Committee with extensive participation by civil and military operators, Kates told Aviation Week.

Northwest Airlines believes it could have its passenger Stratocruiser fleet available for military cargo conversion by 1968. The aircraft would be stripped of the sheet interior with wood supports. The transports would require frequent replacement and periodic operations at full efficiency.

While many of the civilian planes would not be immediately suitable for effective military use, over 90 percent of the transoceanic fleet could theoretically be made available to the military on M-Ds, and 95 percent could be available within a year. Further, airline maintenance facilities are capable of 100 percent expansion—a important factor in support of combined transoceanic military operations.

**Deficit in 1965**—MATS foresees little increase in long-range civil aviation 50 capacity between now and 1965. It thinks that would be true even if passengers demand for more economical operations were currently in production.

Then Kates figures a total of 1600 C-54 equivalents (500 from MATS and 900 from the airlines) as the most four-engine aircraft which can influence military planning in 1965. Even if all 1600 planes were available to and fully suitable for the military, a major transoceanic deficit would still appear.

Kates' figures show that he agrees with the Air Force's division of transoceanic loads between civilian planes and transports. "It is obvious," he declared, "that continued mass employment of transport aircraft will be possible with substantial control of the rate. The fast fleet would make it feasible to deplete the initial strength of America's power to build up the transport strength."

**Present Shortage**—Besides aircraft limitations, a serious shortage of new planes and radio operators exists in the

civil airways, Kates declared. He said that of 2216 total crews, only 65 percent could be manned with flight radio/electronics technicians and only 15 percent with navigators.

"Critical aspect of these shortages is apparent," Kates stated, "when one

considers that under wartime conditions essential navigation may be essential, and emergency communications may require telegraph instead of voice transmission."

► **Antikes Recommended**—Kates has issued the airways that inclusion

of the nation's transport assets during wartime will not necessarily mean that domestic carriers must be stripped of all their long-range equipment.

The MATS commander, in a recent talk before the Society of Automotive Engineers, took note of industry that from the armed forces would attempt a complete takeover of strategic commercial air travel in an emergency (Aviation Week Apr. 11). If the two-stage conversion fleet should prove inadequate to meet emergency wartime air requirements, there is the chance of no alternative. Kates would be the first to insist that long-range transports be diverted to meet long-haul needs resulting in the natural effect," Kates declared.

However, the General expressed hope that the two-stage fleet could suffice requirements. He was not disengaged at persistence of the idea that there will be a clash of military and civilian air transport requirements during wartime.

► **Problem for Board**—Asked whether progress is being made on the problem of relations between civilian and military interests regarding mobilization planning, Kates said he could not answer, since the problem is in the hands of the National Security Resources Board. But under Mr. Rumsfeld's chairmanship I would expect fast and effective action on matters pending at this board.

The MATS commander considered that it is now time, and may never be, possible to determine exactly what proportion of long-range civil aircraft will be available to the military in an emergency. Civilian authorities, he continued, will be asked to provide 35 percent. But operating expenses would be \$6,990,000 for the first quarter of 1965, or 10 percent of the total four-engine commercial fleet (an excess of 110 DC-4s, 250 DC-4s, 70 Constellations and 47 Stratocruisers) will be required with the domestic war time economy.

## WAL Makes Bid for Western Feeders

Western Air Lines is making a serious bid to take over the feeder loads now operated by West Coast Airlines and Southwest Airlines.

WAL has told the Civil Aeronautics Board to give it the feeder passes other than through inadvertence of its parent airline for Pacific Coast Route 85 in through certification of a new carrier, Western Air Lines of the Pacific, Inc., for a Los Angeles-Bellingham, Wash., route. Western at the same time requested CAC to approve its 1965 application of Western Air Lines of the Pacific.

► **Market Test**—The proposed application of Southwest Airlines to take over the routes to cities served by West Coast Airlines (Aviation Week Apr. 17) has

Western worried. It notes that the merged feeder system would serve about 70 cities in Washington, Oregon and California. This is nearly twice as many points as United Air Lines now serves in the same area, and more than five times as many cities as WAL serves in the three states.

If the combined SWA-WCA feeder system achieves additional marketing or shipping subordination, the threat of traffic diversion from the West Coast system would increase. Western states, besides, WAL says it can save the government \$780,000 to \$1 million annually in mail profit if it serves the points now serviced by WCA and SWA.

## Shakedown Costs

### Put NWA in Red

Increased costs resulting from shakedown engine and locomotives of its new \$250 million fleet of Boeing 727s have been reflected in Northwest Airlines' financials for the first half of 1965.

The carrier has reported a \$1,612,000 net loss for the first quarter of this year despite an upward trend. In contrast, NWA's 1964 second quarter profit during the second quarter of the 727s' existence was increased and operating costs are reduced.

During January, February and March, Northwest's total operating revenue gained 14 percent over the corresponding 1964 quarter. Domestic passenger revenue alone increased 31 percent. But operating expenses rose 16,990,000, or 19 percent, from 1964 to \$11,946,500 in fiscal year 1965—more than twice the increase in revenue.

► **Cuts Anticipated**—President Carl Shultz said the heavy costs of launching the 727s in the Northwest had been anticipated by the company. During the shakedown period (the full fleet of ten Stratocruisers went into operation but Jetstar), utilization of the double-decker transports averaged 4 hr 20 min daily. The average time for 45 min, with projections that there will be a further increase during the coming run time, is 3 hr 45 min.

Besides the Stratocruiser expense, reduced passenger resulting from bad weather, and the Minneapolis-Minneapolis segment early March, delayed traffic. Minneapolis is one of the heaviest traffic-generating points on NWA's system, so the reaction to the mishap was unusually severe.

## TAL Gets USAF Overseas Contract

The armed forces' Elgin Standard maintenance at North Carolina have thrown away contract business to the transoceanic airlines

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• **LOK-SKRU**  
• **THE BLIND**  
**Anchor Nut**  
by Rivet

Complete  
Installation  
in Seconds



1 Drill bit (13 mm).

2 Easy Lok-Skrub with  
self-tapping rivet  
Lok-Skrub Rivet.

3 With Lok-Skrub Tool  
drive screw over  
rivet. Rivet is driven  
backwards. Rivet  
passes a blind rivet  
through the hole.

4 To fasten an  
attachment make  
a hole through  
the metal or  
sheet metal  
and pass the  
rivet through  
the hole. Then  
drive the rivet  
through the  
attachment.

Optional internal threads  
of Lok-Skrub receive  
your choice of  
fastener.

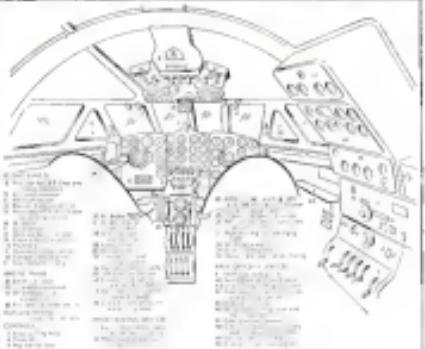
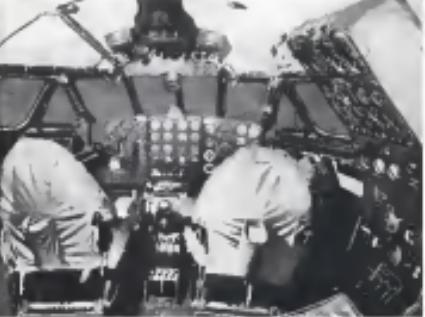
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COMET'S SIMPLIFIED COCKPIT

This cockpit arrangement in dc Stratocruiser's freight, 700 seat, Comet transport has been described by J. A. Birtles, United Air Lines' vice president of engineering, in the same chapter he has over 2000 as a large airplane. He said the simplification is partly due to the reduction in instruments and controls required for turbine engines and partly to

several, powerful engineering by dc Stratocruiser. The cockpit shield visibility better than the Comet cockpit and about as good as the DC-8s, according to Birtles. Reason for the use is made an extensive tour of Comair and Bering to pitch head/tailwind information on various developments abroad.













# 3 TONS A MINUTE...

... of air pours through this intake when the new North American F-95 is flying top speed. Yet the J47 turbojet inside handles this easily and operates reliably, efficiently, and without vibration.

The Air Force's newest interceptor, a stablemate of the speed record-holding North American F-86, is designed for the high speed, high-altitude flight necessary to knock down enemy fighters and bombers. Teamed together, the F-86 and F-95 provide both offensive and defensive air power. Both use General Electric J47 turbojets for high performance under tough conditions.

As the G-E TG-190, this same engine has been certified by the CAA as the first axial-flow turbojet suitable for commercial use. In tomorrow's commercial transports, the TG-190 can provide the same speed, comfort, and dependability that are today built into the fastest and most powerful Air Force planes.

And in addition to the powerplant, General Electric also provides integrated engineering service that assures you of co-ordinated propulsion and electrical systems. From the designer's drawing board to the far-flung outposts of operational aircraft, General Electric's aviation experts can help you. Call your nearest G-E sales representative or write Apparatus Department, General Electric Company, Schenectady 5, New York.

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